TECHNOLOGY TRANSFER OF METHYL BROMIDE ALTERNATIVE FOR SOILBORNE PEST MANAGEMENT

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For purposes of this presentation, Technology Transfer (TT) is defined as the communication or conveyance of information or innovation from a research origin to an agricultural end user. The principal objective of any technology transfer activity is to increase production efficiencies via changes in existing agricultural practices. The actual transfer process for technologies appropriate to agriculture is performed by various profit and nonprofit organizations as well as state and federal research and extension agencies. Previous University of Florida Cooperative Extension survey indicate that farmers obtain and rely on information from a variety of sources, including university research and extension personnel, agricultural consultants, AG-product dealers, distributors, and salesmen, other growers, as well as from a variety of commercial and cooperative extension publications.

Since 1993, when methyl bromide was implicated in the stratospheric ozone depletion process, University of Florida Research and Cooperative Extension Service (UFCES) faculty assumed a leadership role in the technology transfer function regarding alternatives to methyl bromide. UFCES is basically a vertically integrated system of extension specialists with joint research and extension responsibilities, providing programmatic support to county-based extension agents who serve as intermediaries to growers and other AG industry representatives. Organizational structure of extension services in Florida may differ somewhat from other states but principal responsibility and function remain effectively the same. In general, the principal function and responsibility of the UFCES is to collect, interpret, and disseminate information to appropriate clientele for absorption and implementation into the agricultural sector to increase production and resource use efficiencies.

Technology transfer is accomplished by UFCES through a number of different techniques including direct professional contact and assistance, grower workshops, seminars, field demonstrations, distribution of printed materials, as well as via various electronic formats such as radio, television, telephone, and computerized sources. Growers, the actual decision makers of an agricultural operation, are not always the principal recipients of this information. For example, as much as half the audience of a given county extension function may consist of individuals other than growers. This does not necessarily constitute a problem however, since a high proportion of the remainder are individuals from ag product/ consulting industries who rely on and advance UFCES generated crop and pest management recommendations. There are cases, however, in which a farm cooperative general manager or owner of a corporate farm makes decisions for all of its member growers in terms of production practices employed. In this case, targeting and addressing the appropriate person can significantly influence the efficiency of the entire technology transfer process.

In many instances, due to information deficiencies , or conflicts among information sources, growers must distill and integrate information from a variety of sources for their own practical utilization. In at least some cases, farmers may not be capable of determining the accuracy of the information from a single, specific source, let alone conflicting claims from multiple sources. In other cases, on-farm research within the large corporate farms or by progressive farmers serves as a principal source of information and foundation for decision making.

Even in this modern information age with apparent unlimited Internet access, it is not easy to introduce new technology successfully or universally. Oftentimes critical information is unavailable or insufficient to adequately characterize regional or global transferability of new technology among potential user groups. Technology transfer typically involves the following steps; discovery, evaluation, adaptation, and implementation. Given the time constraints of the pending phase out of methyl bromide, Florida growers no doubt will have to play a pivotal role in the adaptive research, local optimization process before broad scale implementation can be achieved. It should also be recognized that a set of measurements that can be used to evaluate the extent to which new technologies are applicable, economically viable, or are being implemented at the farm level do not really exist at this time for many of the alternatives currently proposed or under investigation.

Agricultural production in Florida is extremely diverse in terms of commodities produced, farming practices employed, production regions, as well as temporal, edaphic, and environmental conditions which affect pest incidence, severity, and crop performance. In many cases providing simple descriptions of the technological and economic viabilities of the alternatives has been difficult, as the appropriateness of a given alternative or alternative system is very dependent on a variety of interrelated factors such as climate, market, pest presence and level, land and labor availability, soil type and condition to name but a few. The complex interaction of these factors requires the choice of best alternatives to be developed and implemented on a field-by-field basis. At present it is not possible to provide the level of detail required to make this analysis or formulate a prescription for all crop production systems currently using methyl bromide. The production goals, problems, and capabilities of the different agricultural crop producers vary so greatly within the state of Florida, that there is no “one size fits all’ method for replacement of methyl bromide or for technology transfer.

The speed in which technology can be transferred is exemplified by the economic circumstances regarding initial acceptance and grower adoption of plastic mulch culture and methyl bromide soil fumigation. For example, the University of Florida was principally responsible for the development and refinement of the full-bed mulch system of vegetable production utilizing soil fumigants during the early 1960's. Research and extension transfer of this new system was so rapid during its evaluation and adaptive phases of research that by the mid 1960's, soil fumigation had become such an established practice that 97 percent of the strawberry acreage was treated with a soil fumigant in 1964. Such rapid diffusion and adoption of this new technology was not attributed to information flow between growers, which is typically slow because of corporate secrecy mentality of crop and pest management tactics, but to the significant production and economic gains realized by farmers (the polyethylene mulch soil fumigation system resulted in a four-fold increase in average strawberry yield over that of the previous system). Given this historical framework, it’s obvious that agricultural economics plays a decisive role and provides critical incentives to the adoption of any new technology by growers.

From our perspective, based on grower survey results from technology transfer projects and programs, the real constraint or bottleneck to technology transfer occurs when it is not possible to convey comparison of all of the economic considerations of an alternative strategy relative to the current system of methyl bromide use. To the grower, this occurs because alternatives research programs have largely not been conducted in multipest, multicrop or year formats at various locations around the state; thus, have not adequately characterized risk, uncertainty or impacts of alternative strategies on marginal costs and revenues, particularly beyond a single crop. For example, much of the ongoing field demonstration work in Florida has been almost unavoidably performed in fields with long histories of previous methyl bromide use. Justifiably, growers are skeptical about whether multi year benefits associated with long term use of methyl bromide are not being included within the performance assessments of a particular alternative treatment (i.e., Telone C17 + pebulate). It is fairly obvious that when you do not have complete and relevant information, the more risk you add to the grower decision process, and growers who are uncertain are reluctant to adopt new technology. There is also perceived reluctance on the part of growers when it is not possible to demonstrate that the alternatives are logistically easier, and not harder, to implement with the same or improved yield result (i.e., soil solarization). In addition, many other peripheral issues cannot be adequately addressed to resolve grower fears and uncertainties (i.e., changing labor costs, requirements, and future availability; changes in worker protection standards or future regulatory actions).

There is also a psychological element to the technology transfer process which should be considered. We are not attempting to transfer new, space age technology as a replacement for methyl bromide. In fact, most alternatives research and technology transfer efforts are attempts to reintroduce age-old technologies, some of which have been around for quite literally thousands of years, i.e., crop rotation, cover crops, and fallowing. We are advocating a path to get growers back to where they once were, and it’s quite simply harder to get them back where they were and characterize the move as an advancement, particularly when the alternative technology is not a piece of shiny new equipment, with blinking lights, bells, and whistles, or a genetically engineered, high yielding transgenic plant with multi pest resistance, as well as broad spectrum immunity to herbicide phytotoxicity. Finally, the challenge of research and extension to define and implement alternatives to methyl bromide must address and overcome the perception by growers that this is an altruistic act on the part of U.S. growers to save the planet and mankind from the deleterious effects of stratospheric ozone depletion. Florida growers are keenly aware that the underdeveloped countries, particularly those which fiercely compete with U.S. fruit and vegetable production, are allowed continued use of methyl bromide until 2015, 14 years longer than that of the U.S. They continue to question why they should be expected to adopt regulatory policy which is so much more stringent and compromising to their livelihood than that of the international community. Growers continue to question the fairness of such a policy, particularly now that the most recent scientific assessments no longer appear to reinforce the same global doom and gloom forecasts associated previously with anthropogenic sources of methyl bromide production and use. In an ideal technology transfer environment, we must be able to show that not only will the planetary community benefit, but growers will also be better off (or at least no worse).